



## Targeted Elk Brucellosis Surveillance Project 2023 Annual Report

### EXECUTIVE SUMMARY

Montana Fish, Wildlife & Parks (MFWP), in partnership with Montana Department of Livestock (DOL), is conducting targeted elk brucellosis surveillance to evaluate 1) prevalence and spatial extent of brucellosis exposure in elk populations, and 2) elk spatial overlap with livestock and interchange between elk populations. This report is an annual summary of the 2023 targeted elk brucellosis surveillance project. Throughout 2022 and into May 2023, we monitored movements of 40 elk from the northern Tobacco Root Mountains. In January 2023, we sampled 149 adult female elk from the eastern Pioneer Mountains and screened blood serum for exposure to *B. abortus*. All eastern Pioneer Mountains elk tested negative for exposure to *B. abortus* (prevalence = 0%, 95% CI: 0-2.5%, n = 149). We collared 30 elk in the eastern Pioneer Mountains and are monitoring potential overlap with livestock and interchange between elk populations with GPS radio collars.

## INTRODUCTION

Montana Fish, Wildlife & Parks (MFWP) has conducted surveillance for brucellosis in elk populations since the early 1980s. Surveillance consists of screening blood serum for antibodies signifying exposure to *Brucella abortus*, the bacteria that causes the disease brucellosis. Brucellosis may cause abortion in pregnant elk, typically from February through May (Cross et al. 2015) and is primarily transmitted through contact with infected fetuses, birthing fluids, placenta and fetal membranes, milk, and materials contaminated by those (fomites). Elk that test positive for exposure to *B. abortus* (seropositive) may or may not be actively infected with the bacteria. Although not a true indicator of infection or the ability of an animal to shed *B. abortus* on the landscape, detection of seropositive elk indicates brucellosis is present in the area and indicates the potential for elk to transmit the disease to livestock or other elk.

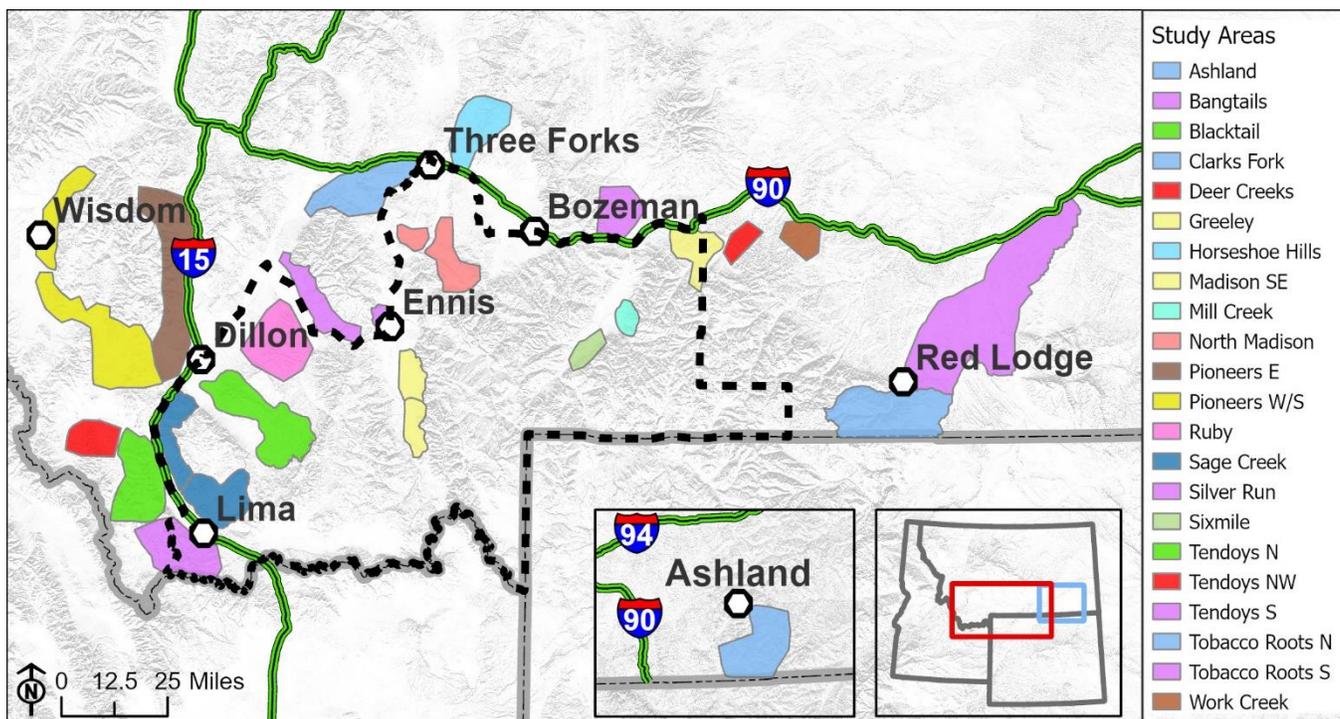
Brucellosis is a concern for Montana livestock producers due to the financial, regulatory, and biological impacts (i.e., abortions, quarantine, restricted sales) caused by detection of brucellosis infection in a livestock herd. Seropositive livestock are removed from herds for additional diagnostic testing, and the remaining herd is placed in quarantine. Herds in which brucellosis infection is confirmed are subject to extended quarantine and repeated testing to ensure that all remaining animals in the herd are brucellosis free. The Montana Department of Livestock (DOL) established the brucellosis Designated Surveillance Area (DSA) in 2010 as an area in southwest Montana where brucellosis infected wildlife exist, posing a transmission risk to cattle and domestic bison. Within the DSA, livestock are routinely screened for exposure to brucellosis. The purpose of the DSA is to prevent infected livestock from moving out of the area, limit disease transmission, and instill confidence with livestock trading partners that Montana's livestock are disease free.

To increase understanding of brucellosis in elk populations, MFWP partnered with DOL and initiated a targeted elk brucellosis surveillance project in 2011. The goals of the project are to 1) evaluate the prevalence and spatial extent of brucellosis exposure in elk populations, and 2) document elk

movements to evaluate the extent of spatial overlap with livestock and interchange between elk populations. In order to achieve these goals, MFWP has conducted targeted sampling and collaring efforts focused on 1 – 2 elk populations per year since 2011. Elk populations targeted for surveillance are identified through collaborative discussions between MFWP, DOL, and landowners and are both inside and outside the State of Montana brucellosis Designated Surveillance Area (DSA, Figure 1). Selection is based on proximity to the known distribution of brucellosis and/or significant livestock concerns. Surveillance identifies the known range of brucellosis in elk and establishes the brucellosis DSA boundary.

### SAMPLED POPULATIONS

Since 2011, we have sampled 22 elk populations (Figure 1). In January 2022, we sampled elk in the northern Tobacco Root Mountains (HD320), deployed 40 GPS collars, and monitored movements



**Figure 1. Elk populations sampled during the 2011 – 2023 targeted elk brucellosis surveillance project. The area inside the black dashed line is the Montana Brucellosis Designated Surveillance Area (DSA).**

through May 2023. In January 2023, we sampled elk in the eastern Pioneer Mountains (HD331 and HD329), deployed 30 GPS collars, and are currently monitoring movements.

## **METHODS**

To evaluate brucellosis presence and prevalence, we captured adult female elk using helicopter net-gunning and collected a blood sample to screen animals for exposure. Exposure was determined by the presence of antibodies to *B. abortus* in an animal's blood serum. Blood serum samples were tested at the Montana Department of Livestock Veterinary Diagnostic Lab (Diagnostic Lab) using the buffered acidified plate antigen (BAPA) test. Samples classified as suspect or reactors to this screening test were further tested with the florescence polarization assay (FPA) tube test. Final classification of serostatus (i.e., seropositive or seronegative) was based on test results received from the Diagnostic Lab.

We deployed satellite GPS collars on a sample of elk in the eastern Pioneer Mountains population to track movements and evaluate risk of brucellosis transmission to livestock and other elk populations. The collars are programmed to record locations every hour and have a timed-release mechanism that releases the collar after 62 weeks, allowing collars to be retrieved and redeployed. All collars have a mortality sensor that detects if the collar is stationary for > 10 hours. This report also summarizes movement data from the northern Tobacco Root Mountains elk population that we monitored in 2022-2023. Movement data collection was completed for the northern Tobacco Roots in May 2023.



## RESULTS

### Brucellosis surveillance

In January 2023, we sampled 149 adult female elk in the eastern Pioneer Mountains and deployed collars on 30 elk (Figure 2, Table 1). All elk tested negative for exposure to *B. abortus*, giving the population an estimated seroprevalence of 0% (95% CI = 0-2.5%; Table 1).

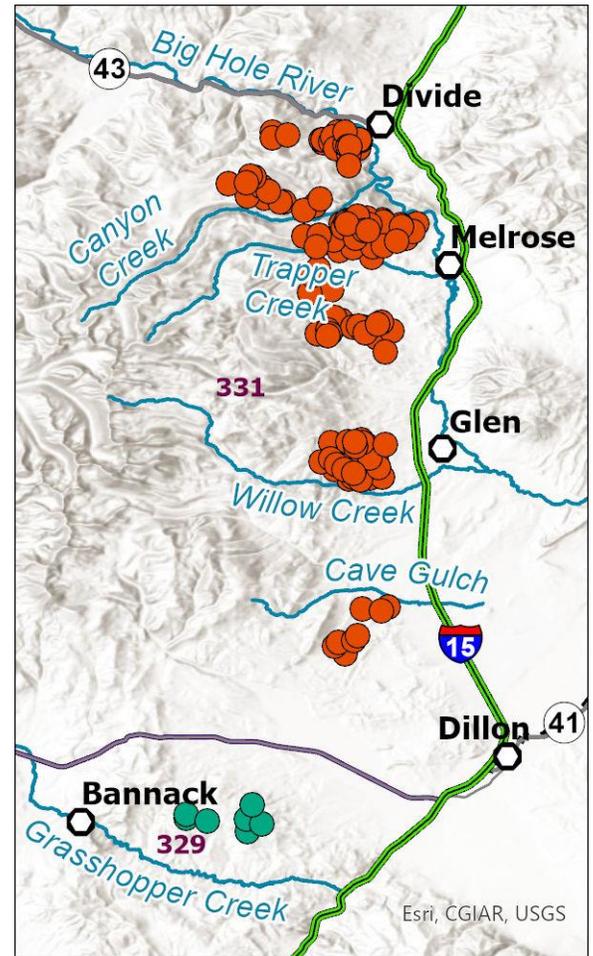
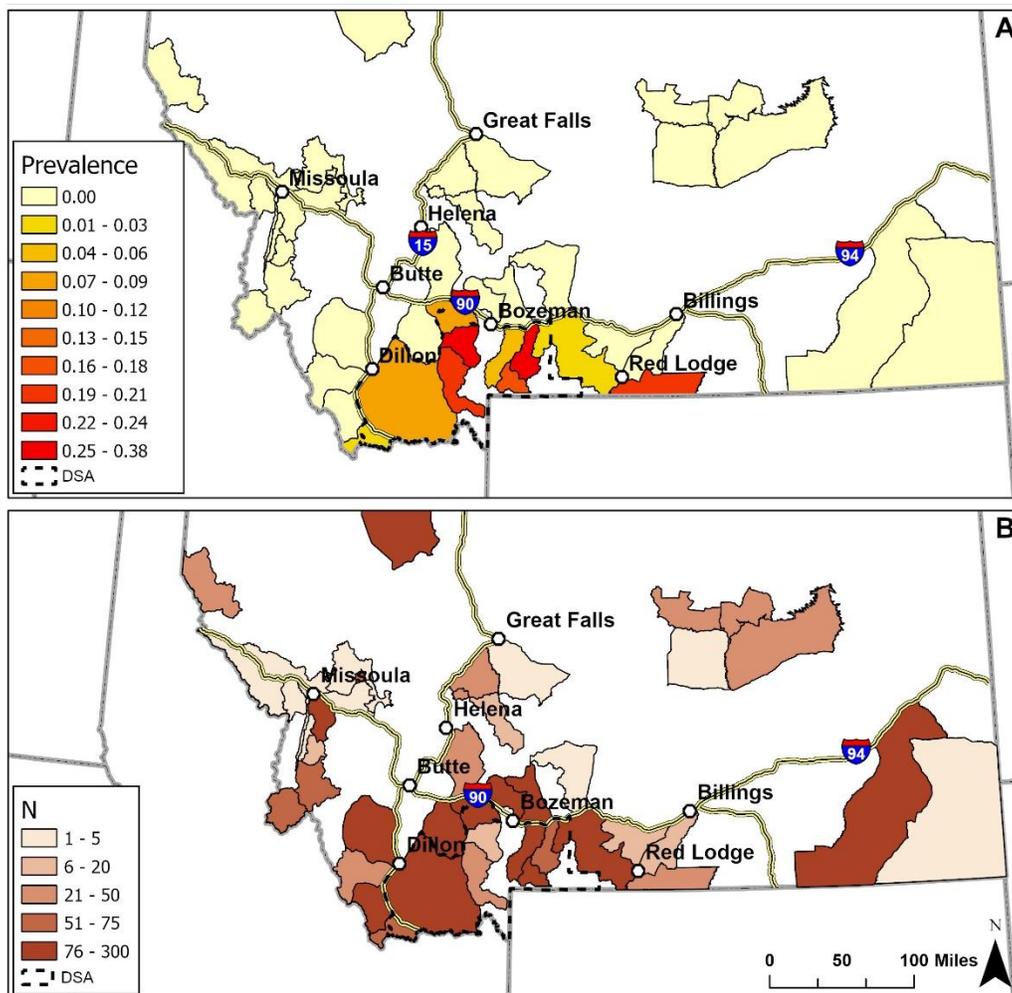


Figure 2. Capture and sampling locations of elk from HD331 (orange) and HD329 (teal) in the eastern Pioneer Mountains during January 2023.

Table 1. The elk populations, number of elk sampled for *B. abortus* exposure, number of elk collared, number of elk testing seropositive for exposure, and the estimated seroprevalence with 95% confidence intervals (in parentheses).

Population	Year	Number Sampled	Number Collared	Number Seropositive	Estimated Seroprevalence
Eastern Pioneers	2023	149	30	0	0 (0, 0.025)

FWP tests all elk being captured and handled for brucellosis, even if the purpose is not brucellosis surveillance. During 2023, we sampled elk in Sanders County and on the Blackfoot Indian Reservation as part of other research projects. To date, no seropositive elk have been found outside of southwest Montana. Based on hunter harvest, targeted brucellosis surveillance, and other elk captures (2010-2023), we estimate brucellosis seroprevalence in elk varies spatially across southwest Montana and ranges from 0 – 38% (Figure 3).



**Figure 3. The estimated brucellosis seroprevalence (Panel A) and number of samples screened (n, Panel B) for adult female elk by hunting district\* during 2010-2023. Samples include those collected opportunistically during fall hunter harvest and during targeted winter sampling. Note some seroprevalence estimates are derived from a low number of samples. The black line denotes the boundary of the Montana brucellosis designated surveillance area (DSA). \*Hunt district boundaries reflect the changes implemented in 2022.**

## **Elk movements**

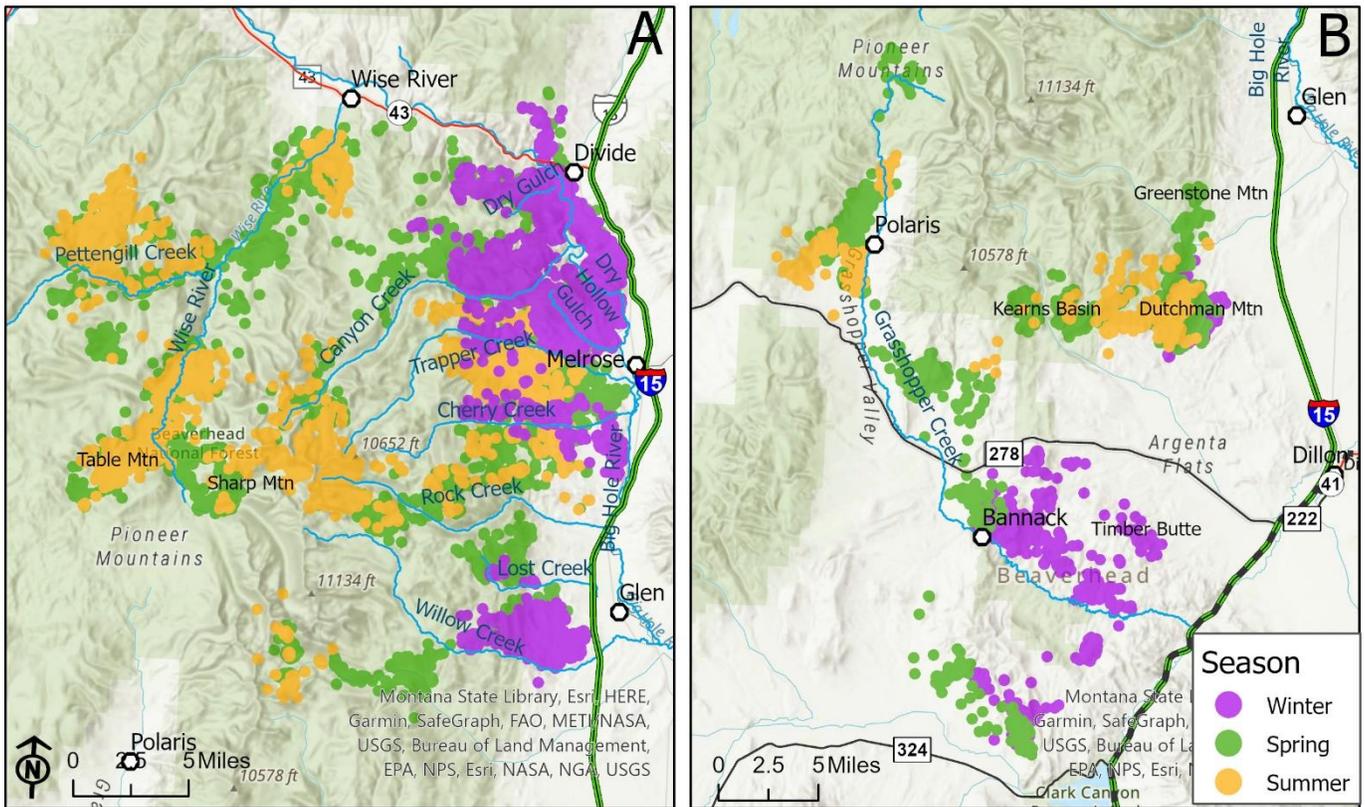
### ***Pioneer Mountains elk movements***

In January 2023 we deployed 30 collars in the eastern Pioneer Mountains. One elk died in June of natural causes. We are continuing to monitor the remaining 29 collars.

Elk captured near Divide are all migrants, spending the winter near the Big Hole River and Dry Gulch (Figure 4A). One elk wintered farther south between Goat and Sheep Mountains. Elk began to migrate in late April/early May and generally moved west to Wise River near Pettengill Creek. Five elk moved farther west along Pettengill Creek to summer near Lost Horse Mountain, while 2 elk moved farther south to Table Mountain. One elk stayed along the Wise River drainage just south of the town of Wise River.

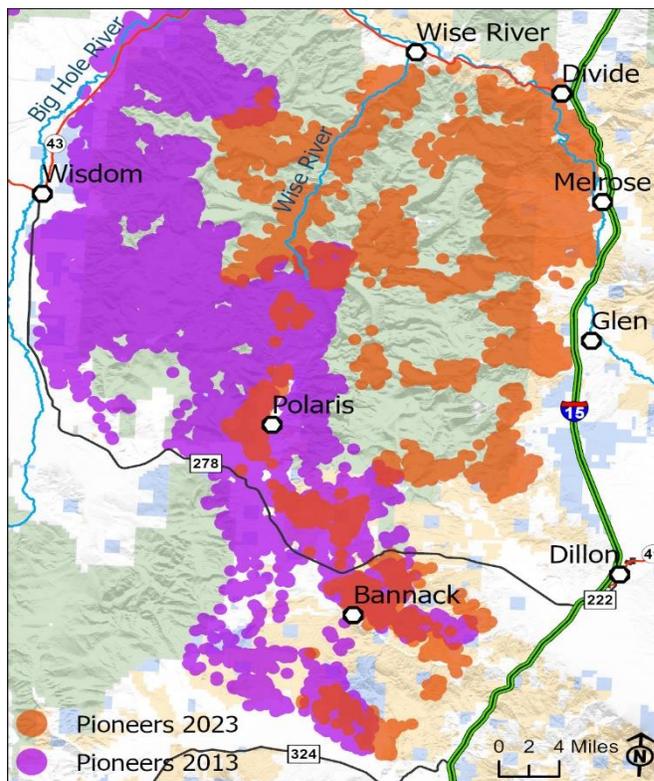
Elk captured near Canyon and Trapper Creeks west of Melrose are a mix of residents and migrants (Figure 4A). Eight resident elk stayed along Trapper Creek, generally on the north side in winter near Dry Hollow Gulch. In April the residents generally moved to the south side of Trapper Creek as far west as Morrison Hill. The 7 migrant elk began moving in early May, generally moving west from the Trapper and Canyon Creek areas to Wise River near Pettengill Creek and then farther up Wise River toward Table Mountain. One migrant moved southwest up Canyon Creek to the area around Sharp Mountain. One elk captured near Cherry Creek to the south is a resident and has stayed along that creek.

Elk captured near Willow Creek winter on the north side of Willow Creek and then migrate north in mid to late April first to the north side of Lost Creek and then continue to the Rock Creek drainage (Figure 4A). The two collared elk captured near Dutchman Mountain appear to be residents, with minor movements and limited time spent as far west as Kearns Basin and north to Greenstone Mountain (Figure 4B). Two elk captured south of MT-278 near Timber Butte spent the winter near Bannack, along Grasshopper Creek and south toward MT-324 (Figure 4B). Both elk migrated in mid to late April to the foothills east of Polaris.



**Figure 4. Movement data by season [Winter (purple): Jan-Mar, Spring (green): Apr-Jun, Summer (yellow): July] from elk captured in the Pioneer Mountains, January – July 2023. Panel A shows movement of elk captured near Divide, Trapper Creek, and Willow Creek. Panel B shows movement of elk captured near Dutchman Mountain and Timber Butte.**

A comparison of movement data collected in 2013 from the western and southern elk populations of the Pioneer Mountains with the movements collected thus far for the eastern elk populations shows overlap in the center of the Pioneer Mountains along Wise River south to Polaris and Bannack (Figure 5). Most of the overlap occurs during summer, but there is some potential mixing during winter in the south near Bannack.



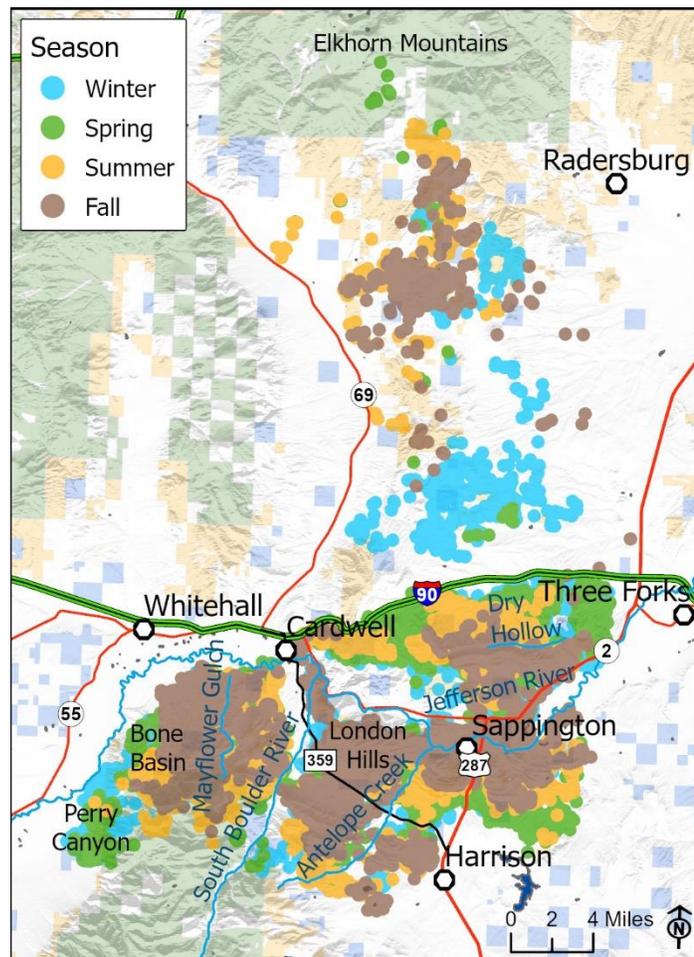
**Figure 5. Annual locations (circles) of Pioneer Mountains elk captured in 2013 (purple) and 2023 (orange).**

***Northern Tobacco Root Mountains elk movements***

In January 2022 we deployed 40 collars in the northern Tobacco Root Mountains. Elk collared in the Bone Basin Creek area (n=13) were residents remaining south of the Jefferson River, primarily in the basin, along Mayflower Gulch, and north/west of the South Boulder River (Figure 6). Bone Basin elk generally spent time wintering at the mouth of Perry Canyon, typically from late December until March. There was some use along the Jefferson River near Cardwell in late April, May, and June. There appears to be no mixing with collared elk from either the London Hills or Dry Hollow/Milligan Canyon area.

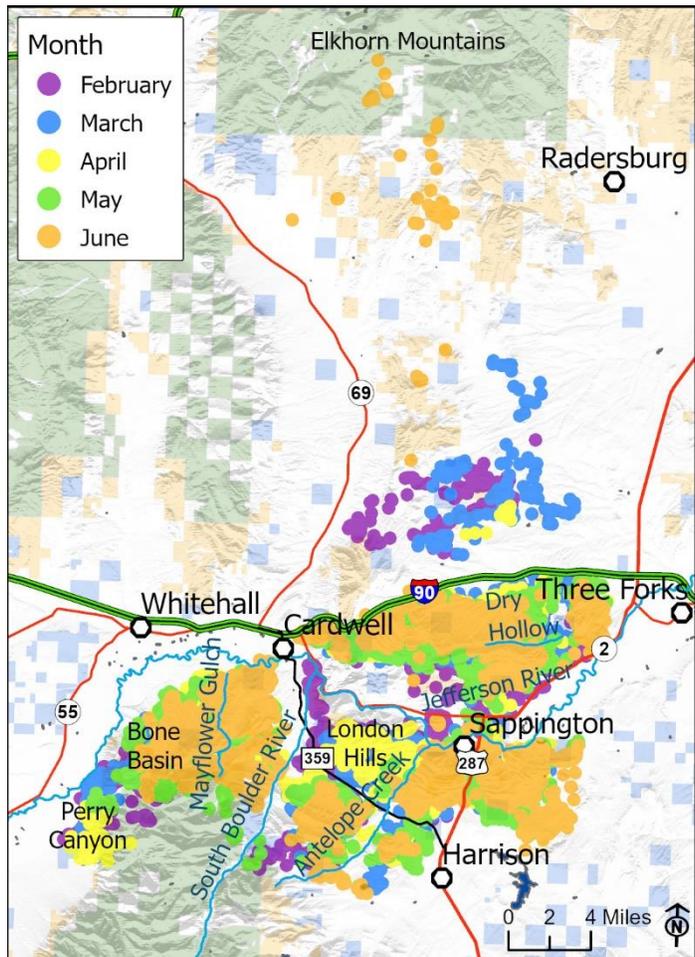
Elk collared in the London Hills (n=4) were primarily residents that wintered in the London Hills, with some movement back and forth across MT-359 (Figure 6). In late April, these elk moved farther south of MT-359, up Antelope Creek, and generally moved back north of MT-359 to the London Hills in October and November. One elk stayed in the London Hills through summer, moved northeast in November to spend time east of Sappington, and then moved farther north to Dry Hollow in January.

Elk collared in the Dry Hollow/Milligan Canyon area (n=23) were primarily short-distance migrants (n=18; Figure 6). These elk typically wintered between Milligan Canyon and Timber Canyon,



**Figure 6. Annual locations (circles) of elk by season [Winter: Dec-Mar, Spring: Apr-Jun, Summer: July-Aug, Fall: Sept-Nov] from the northern Tobacco Roots population, January 2022 – May 2023.**

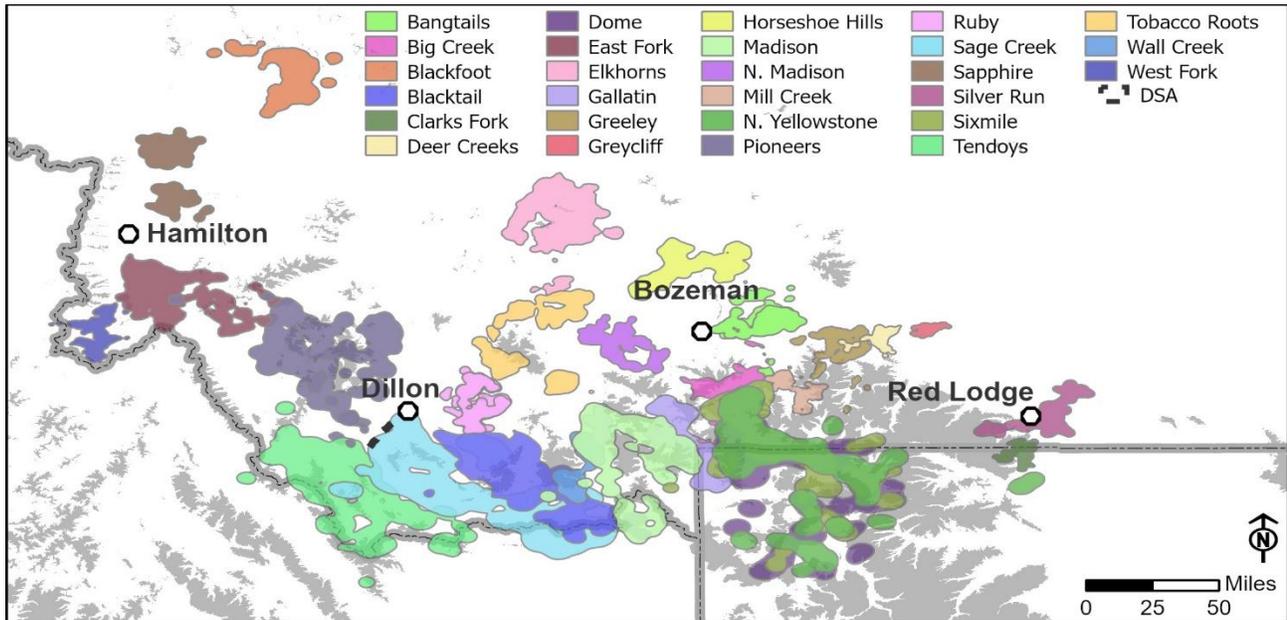
from Dry Hollow north to the foothills above I-90. Movement began in late March and continued until early August, with every elk spending at least some time in the London Hills area. Nine elk also spent time southeast of Sappington and south of the Jefferson River and north of the Harrison reservoir from spring to fall. Fall migration began in early November when all elk returned to the Dry Hollow/Milligan Canyon area. Of note is that 1 elk emigrated to the Elkhorn Mountains north of I90 in late June and never returned. Four elk were residents whose winter range also included the London Hills, and whose winter and summer ranges overlapped. Due to the movement and summer ranges of the Dry Hollow/Milligan Canyon elk there was significant interchange with elk from the London Hills.



**Figure 7. Risk period locations (circles) of elk by month from the northern Tobacco Roots population, February 2022 – June 2022 and February 2023 – May 2023.**

During the February to June risk period (Figure 7), Bone Basin elk were primarily south of Parrot Bench and along Mayflower Gulch, with some use along the Jefferson River near Cardwell in late April to June. London Hills elk were north and south of MT-359. Dry Hollow/Milligan Canyon elk were primarily on winter range south of I90 and north of Dry Hollow. As the risk period progressed these elk spent time southeast of Sappington and in the London Hills.

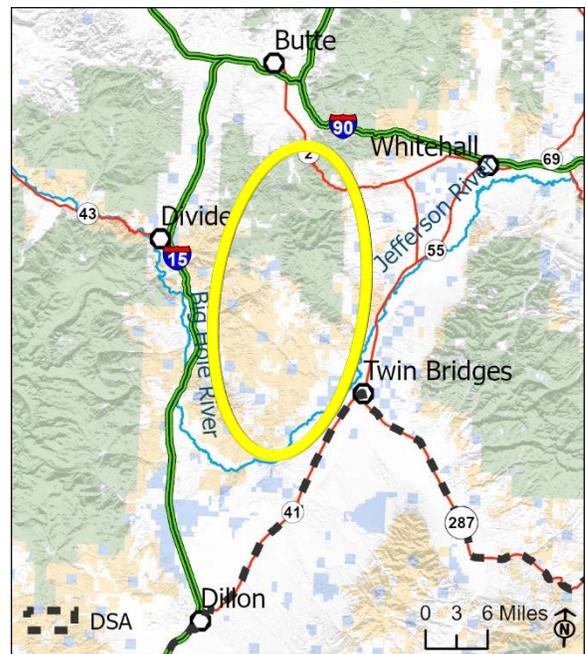
Data from elk collars has improved our understanding of elk movement and potential routes for the spatial spread of brucellosis or other diseases among elk populations (Figure 8). Elk movements have been and will continue to be used to determine the timing and degree of spatial overlap between elk and livestock in focused analyses.



**Figure 8. Annual kernel density distributions of sampled elk populations in southwest Montana showing the potential overlap and interchange between populations. Gray polygons represent mountain ranges.**

### Next Steps

In 2024, we plan to capture and sample 100-150 elk in the Highland Mountains (HD340; Figure 9) south of Butte, MT. These elk have not been sampled for exposure to *B. abortus* and are just outside the brucellosis DSA.



**Figure 9. Planned sampling area (yellow) for 2024 in the Highland Mountains south of Butte, MT. The DSA is a gray dashed line.**

## **Acknowledgements**

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